**3GPP TSG- Meeting #125**S4-231357

**, Sweden, August. – 25. August 2023**

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| *CR-Form-v12.2* |
|  **CHANGE REQUEST** |
|  |
|  |  | **CR** | **0039** | **rev** | **1** | **Current version:** |  |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |

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|  |
| ***Title:***  | [5GMS\_EDGE\_3] Correction of EAS Discovery |
|  |  |
| ***Source to WG:*** | Ericsson LM |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | 5GMS\_EDGE\_3 |  | ***Date:*** | 26.7.2023 |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | The EASDiscoveryTemplate is refering to the wrong specification and binding properties incorrectly.At SA4#124, some considerations around the FQDN discovery and the information within the Service Certificates was added. Specific considerations around EdgeComputing is missing. |
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| ***Summary of change:*** | The EASDiscoveryTemplate is corrected and missing parameters from the EasDiscoveryFilter is added. Some considerations around Edge Computing is added, when creating Server Certificates. |
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| ***Consequences if not approved:*** | The Edge Computing feature cannot be used by 5G Media Streaming Services |
|  |  |
| ***Clauses affected:*** | 4.3.6.1, 7.2.3.1, 7.10.3.3, 11.2.3.2, C.3.1, C.3.9, C.4.1, Annex X (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\*\* Background \*\*\*\*

Section marked as “background” will be removed with the next CR revision.

Figure 1 illustrates the initial provisioning needed for discovering an 5GMS AS and the eventual 5GMS discovery sequence using the Domain Name System (DNS). Specific focus here is on the provisioning and usage of TLS Certificates. Intention is that the 5GMS aware client ensures, that it has connected a TLS connection to an authorized server.



Figure 1: 5GMS AS discovery using DNS

Description of the sequence

At application service deployment time

1. The Application creates TLS server certificates for its application servers. The TLS server certificates may be obtained using M1 Server Certificates Provisioning procedure.

2. The Application provider provisions the application service. The FQDNs of the 5GMS AS are configured using the distributionConfigurations.canonicalDomainName or distributionConfigurations.domainNameAlias properties of the Content Hosting Configuration API.

3. The Application Provider configures the Server Certificate of the domain names using the distributionConfigurations.certificateId property o the Content Hosting Configuration API.

4. The Application Provider configures DNS with the a list of IP addresses for each FQDN. The Application provider may also configure redirections using DNS CNAME records.

At time of installing a 5GMS aware Application on a device

5. When the 5GMS aware Application is installed on a device, it contains an implementation specific bootstrapping sequence for retrieving the needed list of URLs for accessing associated services.

At time of 5GMS aware Application usage

6. When the 5GMS aware Application is implemented using M5 Service Access information retrieval, the 5GMS aware Application triggers the usage of the M5 Service Access Information API. The 5GMS Client retrieve a list of URLs, associated with different 5GMS services.

7. When the 5GMS aware Application desires to access a 5GMS service, it looks up the associated URL and extracts the FQDN.

8. The 5GMS aware application uses DNS for resolving the FQDN to an IP address.

9. The 5GMS aware application establishes a TLS connection to the target IP address. With the responses, the 5GMS aware application obtains the TLS server certificate from the server

10. The 5GMS aware application validates the server certificate. The server certificate validation contains many different steps. One of the steps is to check, whether the Domain Name of the input FQDN (Step 8) is listed within the server certificate, obtained in Step 9.

When all server certificate validation steps are successfully passed, then the following steps are executed

11. The 5GMS aware client continues requesting the resource, identified by the URL.

**Observations wrt Edge Computing usage**

A. When using EdgeComputing (see Figure 2), steps 4 and 8 are replaced by EDGEAPP specific procedures.

- Step 4 is replaced by EDGE-3 EAS registration procedure.

- Step 8 is replaced by EDGE-4 EAS discovery procedure. The 5GMS Client still executes Step 7, but adds the lookup of the EAS Discovery Template for the URL.

B. The configuration and usage of FQDNs is identical:

- FQDNs are configured for 5GMS AS as in step 2 and then extracted from URLs is step 7.

- additional EDGEAPP parameters (the M5 EAS Discovery Template) are associated with the URLs within the Service Access Information and then used in replaced step 8.

- the Content Hosting Configuration does not include any EDGEAPP parameters.

C. A new step is added, when one or more M1 EdgeResourceConfigurations (a list) are provisioned to the provisioning session. There is no association between the M1 Content Hosting Configuration and any of the M1 EdgeResourceConfigurations.

D. The EDGEAPP configuration may still be present for a provisioning session, when no content hosting configuration is available, i.e. not 5GMS AS instantiated for the provisioning session. Other 5GMS services such as consumption reporting or event reporting may also leverage the EdgeResourceConfiguration. This association is also not clear.

E. Usage of Server Certificates is identical.

Figure 2 shows the 5GMS AS discovery with EDGEAPP.



Figure 2: 5GMS AS discovery with EDGEAPP

The intention of the CR is to add some configuration guidelines. When the 5GMS Client uses the M5 EAS Discovery Template information, associated with the URL (Step 7), the discovered EAS instance should still pass the TLS Server Certificate validation (Step 10, matching info from Step 7 & Step 9).

\*\*\*\* First Change \*\*\*\*

#### 4.3.6.1 General

Each X.509 server certificate [8] presented by the 5GMSd AS at reference point M4d or at reference point xMB-U is represented by a Server Certificate resource at M1d. The Server Certificates Provisioning API as specified in clause 7.3 enables a Server Certificate resource to be created within the scope of a Provisioning Session, and subsequently referenced by a Content Hosting Configuration created in the scope of the same Provisioning Session. That API supports two alternative provisioning methods for Server Certificate resources: one in which a certificate is generated by the 5GMS System operator on behalf of the 5GMSd Application Provider; the other in which a certificate is generated by the 5GMSd Application Provider from a Certificate Signing Request solicited from the 5GMSd AF. Both methods shall be supported by implementations of the 5GMSd AF.

When using Edge Computing, the 5GMSd Application Provider is responsible for ensuring that the server certificate configuration matches the EAS Discovery configuration. The Edge Computing environment resolves EAS Discovery Requests based on EAS Characteristics, which does not necessarily include the FQDN or domain names.

NOTE: As a consumer of media from the 5GMSd AS in a combined architecture using 5GMS and eMBMS, the BMSC needs to be able to trust the content it is receiving comes from a bona fide source. This issue is left to implementation.

\*\*\*\* Next Change \*\*\*\*

### 7.2.3 Data model

#### 7.2.3.1 ProvisioningSession resource

The data model for the ProvisioningSession resource is specified in Table 7.2.3.1-1 below. Different properties are present in the resource depending on the type of Provisioning Session indicated in the provisioningSessionType property, and this is specified in the *Applicability* column.

Table 7.2.3.1‑1: Definition of ProvisioningSession resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Property name | Type | Cardinality | Usage | Description | Applicability |
| provisioningSessionId | ResourceId | 1..1 | C: RR: RO | A unique identifier for this Provisioning Session. | All types. |
| provisioningSession‌Type | Provisioning‌Session‌Type | 1..1 | C: RWR: ROU: – | The type of Provisioning Session. | All types. |
| aspId | AspId | 0..1 | C: WR: RO | The identity of the Application Service Provider responsible for this Provisioning Session, as specified in clause 5.6.2.3 of TS 29.514 [34]. | All types. |
| externalApplicationId | ApplicationId | 1..1 | C: RWR: ROU: RO | The external application identifier (see TS 29.571 [12]), nominated by the 5GMS Application Provider, to which this Provisioning Session pertains. | All types. |
| serverCertificateIds | Array(ResourceId) | 0..1 | C: –R: RO | A list of Server Certificate identifiers currently associated with this Provisioning Session. | downlink |
| contentPreparation‌TemplateIds | Array(ResourceId) | 0..1 | C: –R: RO | A list of Content Preparation Template identifiers currently associated with this Provisioning Session. | downlink,uplink |
| metricsReporting‌ConfigurationIds | Array(ResourceId) | 0..1 | C: –R: RO | A list of Metrics Reporting Configuration identifiers currently associated with this Provisioning Session. | downlink,uplink |
| policyTemplateIds | Array(ResourceId) | 0..1 | C: –R: RO | A list of Policy Template identifiers currently associated with this Provisioning Session. | downlink,uplink |
| edgeResources‌ConfigurationIds | Array(ResourceId) | 0..1 | C: –R: RO | A list of Edge Resources Configuration identifiers currently associated with this Provisioning Session.At most one value shall be present. | downlink,uplink |
| eventDataProcessing‌ConfigurationIds | Array(ResourceId) | 0..1 | C: –R: RO | A list of Event Data Processing Configuration identifiers currently associated with this Provisioning Session. | downlink,uplink |

\*\*\*\* Next Change \*\*\*\*

#### 7.6.3.1 ContentHostingConfiguration resource

The data model for the ContentHostingConfiguration resource is specified in table 7.6.3.1-1 below:

Table 7.6.3.1-1: Definition of ContentHostingConfiguration resource

| Property name | Data Type | Cardinality | Description |
| --- | --- | --- | --- |
| name | String | 1..1 | A name for this Content Hosting Configuration. |
| ingestConfiguration | Object | 1..1 | Describes the 5GMSd Application Provider's origin server from which media resources will be ingested via interface M2d. |
|  pull | Boolean | 1..1 | Indicates whether to the 5GMSd AS shall use Pull or Push for ingesting the content. |
|  protocol | Uri | 1..1 | A fully-qualified term identifier allocated in the name space urn:3gpp:5gms:content-protocol that identifies the content ingest protocol.The set of supported protocols is defined in clause 8. |
|  baseURL | AbsoluteUrl | 0..1 | A base URL (i.e. one that includes a scheme, authority and, optionally, path segments) from which content is ingested at reference point M2d for this ingest configuration.In the case of Pull-based content ingest (pull flag is set to True), the base URL shall be provided to the 5GMSd AF to indicate the location from which content is to be pulled for this Content Hosting Configuration. A request received at reference point M4d is mapped by the 5GMSd AS to a URL at reference point M2d whose base is the value of this property.In the case of Push-based content ingest (pull flag is set to False), this property is populated by the 5GMSd AF and returned to the 5GMSd Application Provider to indicate the base URL to which content for this Content Hosting Configuration is to be published. |
| distributionConfigurations | Array(Object) | 1..1 | Specifies the distribution method and configuration for the ingested content.More than one distribution may be configured for the ingested content, e.g. to offer different distribution configurations such as DASH and HLS. |
|  entryPoint | M1‌Media‌Entry‌Point | 0..1 | The Media Entry Point when this distribution configuration is used to describe a single content item.Omitted when this distribution configuration describes multiple content items. |
|  relativePath | RelativeUrl | 1..1 | A relative path (i.e. without a scheme or any leading forward slash characters) to the resource for the Media Entry Point. The semantics are dependent on the value of ingestConfiguration.protocol, as specified in clause 8.The path shall be valid at reference point M2d when appended to the ingest base URL and at reference point M4d when appended to the distribution base URL. |
|  contentType | String | 1..1 | The MIME content type of the Media Entry Point.Used by the 5GMS Client to select a distribution configuration. |
|  profiles | Array(Uri) | 0..1 | An optional list of conformance profile identifiers associated with the Media Entry Point, each one expressed as a URI. A profile URI may indicate an interoperability point, for example.Used by the 5GMS Client to select a distribution configuration.If present, the array shall contain at least one item. |
|  contentPreparationTemplateId | ResourceId | 0..1 | Indicates that content preparation prior to distribution is requested by the 5GMSd Application Provider. It identifies the Content Preparation Template that shall be used as defined in clause 7.4. |
|  supplementary‌Distribution‌Networks | Array(<Distribution‌NetworkType, DistributionMode> | 0..1 | Specifies that the content for this distribution configuration is to be distributed via one of more supplementary networks. Each member of the array is a duple mapping a type of distribution network to a mode of distribution.The same DistributionNetworkType value shall appear at most once in the array. |
|  canonicalDomainName | String | 0..1 | All resources of the current distribution shall be accessible through this default Fully Qualified Domain Name assigned by the 5GMSd AF. |
|  domainNameAlias | String | 0..1 | The 5GMSd Application Provider may assign another Fully-Qualified Domain Name through which media resources are additionally accessible at M4d.This domain name is used by the 5GMSd AS to select an appropriate Server Certificate to present at M4d, and to set appropriate CORS HTTP response headers at M4d.If this property is present, the 5GMSd Application Provider is responsible for providing in the DNS a CNAME record that resolves domainNameAlias to canonicalDomainName. |
|  baseURL | AbsoluteUrl | 0..1 | A base URL (i.e. one that includes a scheme, authority and, optionally, path segments) from which content is made available to 5GMS Clients at reference point M4d for this distribution configuration.The value is chosen by the 5GMSd AF when the Content Hosting Configuration is provisioned. It is an error for the 5GMSd Application Provider to set this. |
|  pathRewriteRules | Array(Object) | 0..1 | An ordered list of rules for rewriting the request URL paths of media resource requests handled by the 5GMSd AS.If multiple rules match a particular resource's path, only the first matching rule, in order of appearance in this array, shall be applied. |
|  requestPathPattern | String | 1..1 | A regular expression [5] against which the path part of each 5GMSd AS request URL, including the leading "/", and up to and including the final "/", shall be compared. (Any leaf path element following the final "/" shall be excluded from this comparison.)In the case of Pull-based ingest, the M4d download request path is used in the comparison.In the case of Push-based ingest, the M2d upload request path is used in the comparison.In either case, if the request path matches this pattern, the path mapping specified in the corresponding mappedPath shall be applied. |
|  mappedPath | String | 1..1 | A replacement for the portion of the 5GMSd AS request path that matches requestPathPattern.In the case of Pull-based ingest, ingestConfiguration.entryPoint is concatenated with the mapped path and any leaf path element from the original M4d download request to form the M2d origin request URL.In the case of Push-based ingest, canonicalDomainName (and, optionally, domainNameAlias) are concatenated with the mapped path and any leaf path element from the original M2d upload request to form the distribution URL(s) exposed over M4d. |
|  cachingConfigurations | Array(Object) | 0..1 | Defines a configuration of the 5GMSd AS cache for a matching subset of media resources ingested in relation to this Content Hosting Configuration. |
|  urlPatternFilter | String | 1..1 | A pattern that will be used to match media resource URLs to determine whether a given media resource is eligible for caching by the 5GMSd AS. The format of the pattern shall be a regular expression as specified in [5]. |
|  cachingDirectives | Object | 1..1 | If a urlPatternFilter applies to a resource, then the provided cachingDirectives shall be applied by the 5GMSd AS at M4d, potentially overwriting any origin caching directives ingested at M2d. |
|  statusCodeFilters | Array(Integer) | 0..1 | The set of HTTP origin response status codes to which these cachingDirectives apply. The filter shall be provided as a regular expression as specified in [5].If the list is empty, the CachingDirectives shall apply to all HTTP origin response status codes at M2d. |
|  noCache | Boolean | 1..1 | If set to True, this indicates that the media resources matching the filters shall not be cached by the 5GMSd AS and shall be marked as not to be cached when served by the 5GMSd AS at M4d. |
|  maxAge | Integer | 0..1 | The caching time-to-live period that shall be set on ingested media resources matching the filters. This determines the minimum period for which the 5GMSd AS shall cache matching media resources as well as the time-to-live period signalled by the 5GMSd AS at interface M4d when it serves such media resources.The time-to-live for a given media resource shall be calculated relative to the time it was ingested. |
|  geoFencing | Object | 0..N | Limit access to the content to the indicated geographic areas. |
|  locatorType | Uri | 1..1 | The type of the locators shall be indicated using a fully-qualified term identifier URI from the controlled vocabulary urn:3gpp:5gms:‌locator‑type, as specified in clause 7.6.4.6, or else from a vendor-specific vocabulary. |
|  locators | Array(String) | 1..1 | Array of locators from which access to the resources is to be allowed. The format of the locator strings shall be determined by the value of locatorType, as specified in clause 7.6.4.6. |
|  urlSignature | Object | 0..1 | Defines the URL signing scheme. Only correctly signed and valid URLs will be allowed to access the content resource at M4d. |
|  urlPattern | String | 1..1 | A pattern that shall be used by the 5GMSd AS to match M4d media resource URLs. The 5GMSd AS shall not serve a matching media resource at M4d unless it includes a valid authentication token calculated over the portion of the M4d request URL that matches this pattern. The format of the pattern shall be a regular expression as specified in [5]. |
|  tokenName | String | 1..1 | The name of the M4d request query parameter that the Media Player should use to present the authentication token when required to do so. |
|  passphraseName | String | 1..1 | The name of the query parameter that is used to refer to the passphrase when constructing the authentication token.Note that the token is not included in the cleartext part of the M4d URL query component. |
|  passphrase | String | 1..1 | The shared secret between the 5GMSd Application Provider and the 5GMSd AS for this distributionConfiguration.The passphrase is used in the computation and verification of the M4d authentication token but is never sent in-the-clear over that interface. |
|  tokenExpiryName | String | 1..1 | The name of the M4d request query parameter that the Media Player should use to present the token expiry field. |
|  useIPAddress | Boolean | 1..1 | If set to True, the IP address of the UE is included in the computation of the authentication token for resources that match urlPattern and access to matching media resources shall be allowed by the 5GMSd AF only when the M4d request is made from a UE with this IP address. |
|  ipAddressName | String | 0..1 | The name of the M4d request query parameter that is encoded as part of the authentication token if the useIPAddress flag is set to True.Note that the IP address is not passed in the cleartext part of the M4d URL query component. |
|  certificateId | ResourceId | 0..1 | When content is distributed using TLS [16], the X.509 [8] certificate for the origin domain is shared with the 5GMSd AF so that it can be presented by the 5GMSd AS in the TLS handshake at M4d. This attribute indicates the identifier of the certificate to use. |
| edgeResourcesConfigurationId | ResourceId | 0..1 | When present, the 5GMSd AS supporting content distribution shall be deployed as a set of one or more EAS instances. |

\*\*\*\* Next Change \*\*\*\*

#### 7.10.3.3 EASRequirements type

The EASRequirements type is specified in table 7.10.3.3-1 below:

Table 7.10.3.3-1: Definition of EASRequirements type

|  |  |  |  |
| --- | --- | --- | --- |
| Property name | Type | Cardinality | Description |
| easProviderIds | array(string) | 0..1 | The set of acceptable providers of 5GMS EAS instances associated with this Provisioning Session.If empty, EAS instances from any provider are acceptable. |
| easId | string | 0..1 | The Application Identifier (e.g., in the form of a URI or Fully-Qualified Domain Name) of a set of EAS instances, or of a particular EAS instance associated with this Provisioning Session. |
| easType | string | 0..1 | The type of 5GMS EAS instances associated with this Provisioning Session. |
| easFeatures | array(string) | 0..1 | 5GMS EAS service features required to be supported by EAS instances associated with this Provisioning Session.If empty, 5GMS EAS instances of the specified easType with any feature set are acceptable. |
| serviceKpi | EASServiceKPI | 0..1 | Service characteristics required to be satisfied by 5GMS AS EAS instances associated with this Provisioning Session.If absent, 5GMS EAS instances with any service characteristics are acceptable. |
| serviceArea | Geographical‌Service‌Area | 0..1 | The list of geographical areas that 5GMS EAS instances associated with this Provisioning Session are required to serve.If absent, 5GMS EAS instances shall serve all geographical areas whenever possible. |
| service‌Availability‌Schedule | array(Scheduled‌Communication‌Time) | 0..1 | The required availability schedule for 5GMS EAS instances associated with this Provisioning Session.If omitted, 5GMS EAS instances are required to be available at all times. |
| service‌Continuity‌Scenarios | array(ACRScenario) | 0..1 | The Application Context Relocation scenarios that 5GMS EAS instances associated with this Provisioning Session are required to support for service continuity.If omitted 5GMS EAS instances are not required to support service continuity across EAS relocation. |
| NOTE: Data types ScheduledCommunicationTime, GeographicalServiceArea, EASServiceKPI, and ACRScenario are defined in TS 29.558 [43]. |

\*\*\*\* Next Change \*\*\*\*

#### 11.2.3.2 EASDiscoveryTemplate type

Table 6.4.3.10-1  Definition of EASDiscoveryTemplate type

|  |  |  |  |
| --- | --- | --- | --- |
| Property name | Type | Cardinality | Description |
| easId | string | 0..1 | The application identifier of the EAS, e.g. FQDN, URI.If omitted, any 5GMS EAS instance matching the other criteria specified in the template are acceptable.Corresponding to EasCharacteristics.easId, as specified in clause 6.3.5.2.7 of TS 24.558 [43]. |
| easType | string | 0..1 | If present, a non-empty string indicating the type of 5GMS EAS required to support media streaming sessions in the scope of this discovery template.Corresponding to EasCharacteristics.easType, as specified in clause 6.3.5.2.7 of TS 24.558 [43]. |
| easProviderIds | array(string) | 0..1 | The set of acceptable EAS provider identifiers.If omitted, 5GMS EAS instances of the specified easType from any provider are acceptable.Corresponding to EasCharacteristics.easProvId, as specified in clause 6.3.5.2.7 of TS 24.558 [43]. |
| easFeatures | array(string) | 0..1 | The required service features for the EAS to serve this session.If omitted, 5GMS EAS instances of the specified easType with any feature set are acceptable.Corresponding to EasCharacteristics.svcFeats, as specified in clause 6.3.5.2.7 of TS 24.558 [43]. |
| NOTE: At least one of the properties shall contain a value. |

\*\*\*\* Next Change \*\*\*\*

## C.3.1 M1\_ProvisioningSessions API

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| openapi: 3.0.0info:  title: M1\_ProvisioningSessions  version: 2.0.2  description: |    5GMS AF M1 Provisioning Sessions API    *© 2023*, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).    All rights reserved.tags:  - name: M1\_ProvisioningSessions    description: '5G Media Streaming: Provisioning (M1) APIs: Provisioning Sessions'externalDocs:  description: 'TS 26.512 V17.6.0; 5G Media Streaming (5GMS); Protocols'  url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'servers:  - url: '{apiRoot}/3gpp-m1/v2'    variables:      apiRoot:        default: https://example.com        description: See 3GPP TS 29.512 clause 6.1.paths:  /provisioning-sessions:    post:      operationId: createProvisioningSession      summary: 'Create a new Provisioning Session'      responses:        '201':          description: 'Provisioning Session Created'          headers:            Location:              description: 'URL including the resource identifier of the newly created Provisioning Session.'              required: true              schema:                $ref: 'TS26512\_CommonData.yaml#/components/schemas/AbsoluteUrl'          content:            application/json:              schema:                $ref: '#/components/schemas/ProvisioningSession'  /provisioning-sessions/{provisioningSessionId}:    parameters:        - name: provisioningSessionId          in: path          required: true          schema:            $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'          description: 'The resource identifier of an existing Provisioning Session.'    get:      operationId: getProvisioningSessionById      summary: 'Retrieve an existing Provisioning Session'      responses:        '200':          description: 'Success'          content:            application/json:              schema:                $ref: '#/components/schemas/ProvisioningSession'    delete:      operationId: destroyProvisioningSession      summary: 'Destroy an existing Provisioning Session'      responses:        '204':          description: 'Provisioning Session Destroyed'          # No Contentcomponents:  schemas:    ProvisioningSession:      type: object      description: "A representation of a Provisioning Session."      required:        - provisioningSessionId        - provisioningSessionType        - externalApplicationId      properties:        provisioningSessionId:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'        provisioningSessionType:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/ProvisioningSessionType'        aspId:          $ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/AspId'        externalApplicationId:          $ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'        serverCertificateIds:          type: array          items:            $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'          minItems: 1          uniqueItems: true        contentPreparationTemplateIds:          type: array          items:            $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'          minItems: 1          uniqueItems: true        metricsReportingConfigurationIds:          type: array          items:            $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'          minItems: 1          uniqueItems: true        policyTemplateIds:          type: array          items:            $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'          minItems: 1          uniqueItems: true        edgeResourcesConfigurationIds:          type: array          items:            $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'          minItems: 1          maxItems: 1          uniqueItems: true        eventDataProcessingConfigurationIds:          type: array          items:            $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'          minItems: 1          uniqueItems: true |

\*\*\*\* Next Change \*\*\*\*

## C.3.9 M1\_EdgeResourcesProvisioning API

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| openapi: 3.0.0info:  title: M1\_EdgeResourcesProvisioning  version: 2.1.2  description: |    5GMS AF M1 Edge Resources Provisioning API    © 2023, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).    All rights reserved.tags:  - name: M1\_EdgeResourcesProvisioning    description: '5G Media Streaming: Provisioning (M1) APIs: Edge Resources Provisioning'externalDocs:  description: 'TS 26.512 V17.6.0; 5G Media Streaming (5GMS); Protocols'  url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'servers:  - url: '{apiRoot}/3gpp-m1/v2'    variables:      apiRoot:        default: https://example.com        description: See 3GPP TS 29.512 clause 7.10.paths:  /provisioning-sessions/{provisioningSessionId}/edge-resources-configurations:    parameters:      - name: provisioningSessionId        in: path        required: true        schema:           $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'        description: 'The resource identifier of an existing Provisioning Session.'    post:      operationId: createEdgeResourcesConfiguration      summary: 'Create an Edge Resources Configuration within the scope of the specified Provisioning Session'      requestBody:        description: 'A JSON representation of an Edge Resources Configuration'        required: true        content:          application/json:            schema:              $ref: '#/components/schemas/EdgeResourcesConfiguration'      responses:        '201':          description: 'Edge Resources Configuration Created'          headers:            Location:              description: 'URL of the newly created Edge Resources Configuration.'              required: true              schema:                $ref: 'TS26512\_CommonData.yaml#/components/schemas/AbsoluteUrl'  /provisioning-sessions/{provisioningSessionId}/edge-resources-configurations/{edgeResourcesConfigurationId}:    parameters:      - name: provisioningSessionId        in: path        required: true        schema:           $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'        description: 'The resource identifier of an existing Provisioning Session.'      - name: edgeResourcesConfigurationId        in: path        required: true        schema:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'        description: 'The resource identifier of an existing Edge Resources Configuration.'    get:      operationId: retrieveEdgeResourcesConfiguration      summary: 'Retrieve the Edge Resources Configuration of the specified Provisioning Session'      responses:        '200':          description: 'Success'          content:            application/json:              schema:                $ref: '#/components/schemas/EdgeResourcesConfiguration'    put:      operationId: updateEdgeResourcesConfiguration      summary: 'Update an Edge Resources Configuration for the specified Provisioning Session'      requestBody:        description: 'A JSON representation of an Edge Resources Configuration'        required: true        content:          application/json:            schema:              $ref: '#/components/schemas/EdgeResourcesConfiguration'      responses:        '204':          description: 'Updated Edge Resources Configuration'        '404':          description: 'Not Found'    patch:      operationId: patchEdgeResourcesConfiguration      summary: 'Patch the Edge Resources Configuration for the specified Provisioning Session'      requestBody:        description: 'A JSON representation of a Edge Resources Configuration'        required: true        content:          application/merge-patch+json:            schema:              $ref: '#/components/schemas/EdgeResourcesConfiguration'          application/json-patch+json:            schema:              $ref: '#/components/schemas/EdgeResourcesConfiguration'      responses:        '200':          description: 'Patched Edge Resources Configuration'          content:            application/json:              schema:                $ref: '#/components/schemas/EdgeResourcesConfiguration'        '404':          description: 'Not Found'    delete:       operationId: destroyEdgeResourcesConfiguration      responses:        '204':          description: 'Destroyed Edge Resources Configuration'        '404':          description: 'Not Found'components:  schemas:        EdgeResourcesConfiguration:      type: object      description: 'A representation of an Edge Resources Configuration resource.'      required:        - edgeResourcesConfigurationId        - edgeManagementMode        - easRequirements      properties: edgeResourcesConfigurationId: $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'        edgeManagementMode:          $ref: '#/components/schemas/EdgeManagementMode'        eligibilityCriteria:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/EdgeProcessingEligibilityCriteria'        easRequirements:          $ref: '#/components/schemas/EASRequirements'        easRelocationRequirements:          $ref: '#/components/schemas/M1EASRelocationRequirements'    M1EASRelocationRequirements:      type: object      description: 'Relocation requirements of an EAS.'      required:        - tolerance      properties:        tolerance:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/EASRelocationTolerance'        maxInterruptionDuration:          $ref: 'TS29571\_CommonData.yaml#/components/schemas/UintegerRm'        maxResponseTimeDifference:          $ref: 'TS29571\_CommonData.yaml#/components/schemas/UintegerRm'    EASRequirements:        type: object        description: 'Requirements of an EAS.'        properties:          easProviderIds:            type: array            items:              type: string            minItems: 1          easId:            type: string          easType:            type: string          easFeatures:            type: array            items:              type: string            minItems: 1          serviceKpi:            $ref: 'TS29558\_Eees\_EASRegistration.yaml#/components/schemas/EASServiceKPI'          serviceArea:            $ref: 'TS29558\_Eecs\_EESRegistration.yaml#/components/schemas/GeographicalServiceArea'          serviceAvailabilitySchedule:            type: array            items:              $ref: 'TS29122\_CpProvisioning.yaml#/components/schemas/ScheduledCommunicationTime'            minItems: 1          serviceContinuityScenarios:            type: array            items:              $ref: 'TS29558\_Eecs\_EESRegistration.yaml#/components/schemas/ACRScenario'            minItems: 1          serviceContinuitySupport:            type: array            items:              $ref: 'TS29558\_Eecs\_EESRegistration.yaml#/components/schemas/ACRScenario'            minItems: 1    EdgeManagementMode:      description: 'The management mode of an EAS.'      anyOf:        - type: string          enum: [EM\_AF\_DRIVEN, EM\_APP\_DRIVEN]        - type: string          description: >            This string provides forward-compatibility with future            extensions to the enumeration but is not used to encode            content defined in the present version of this API. |

\*\*\*\* Next Change \*\*\*\*

## C.4.1 M5\_ServiceAccessInformation API

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| openapi: 3.0.0info:  title: M5\_ServiceAccessInformation  version: 2.2.2  description: |    5GMS AF M5 Service Access Information API    *©* 2023, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).    All rights reserved.tags:  - name: M5\_ServiceAccessInformation    description: '5G Media Streaming: Media Session Handling (M5) APIs: Service Access Information'externalDocs:  description: 'TS 26.512 V17.6.0; 5G Media Streaming (5GMS); Protocols'  url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'servers:  - url: '{apiRoot}/3gpp-m5/v2'    variables:      apiRoot:        default: https://example.com        description: See 3GPP TS 29.512 clause 6.1.paths:  /service-access-information/{provisioningSessionId}:    parameters:      - name: provisioningSessionId        description: 'The resource identifier of an existing Provisioning Session.'        in: path        required: true        schema:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'    get:      operationId: retrieveServiceAccessInformation      summary: 'Retrieve the Service Access Information resource'      responses:        '200':          description: 'Success'          content:            application/json:              schema:                  $ref: '#/components/schemas/ServiceAccessInformationResource'        '404':          description: 'Not Found'components:  schemas:    M5MediaEntryPoint:      description: "A typed entry point for downlink or uplink media streaming."      type: object      required:        - locator        - contentType      properties:        locator:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/AbsoluteUrl'        contentType:          type: string        profiles:          type: array          items:            $ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'          minItems: 1    ServerAddresses:      description: "A set of application endpoint addresses."      type: array      items:        $ref: 'TS26512\_CommonData.yaml#/components/schemas/AbsoluteUrl'      minItems: 1    ServiceAccessInformationResource:      description: "A representation of a Service Access Information resource."      type: object      required:      - provisioningSessionId      - provisioningSessionType      properties:        provisioningSessionId:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'        provisioningSessionType:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/ProvisioningSessionType'        streamingAccess:          type: object          properties:            entryPoints:              type: array              items:                $ref: '#/components/schemas/M5MediaEntryPoint'            eMBMSServiceAnnouncementLocator:              $ref: 'TS26512\_CommonData.yaml#/components/schemas/AbsoluteUrl'        clientConsumptionReportingConfiguration:          type: object          required:            - serverAddresses            - locationReporting            - samplePercentage          properties:            reportingInterval:              $ref: 'TS29571\_CommonData.yaml#/components/schemas/DurationSec'            serverAddresses:              $ref: '#/components/schemas/ServerAddresses'            locationReporting:              type: boolean            accessReporting:              type: boolean            samplePercentage:              $ref: 'TS26512\_CommonData.yaml#/components/schemas/Percentage'        dynamicPolicyInvocationConfiguration:          type: object          required:            - serverAddresses            - validPolicyTemplateIds            - sdfMethods          properties:             serverAddresses:              $ref: '#/components/schemas/ServerAddresses'            validPolicyTemplateIds:              type: array              items:                 $ref: 'TS26512\_CommonData.yaml#/components/schemas/ResourceId'              minItems: 0            sdfMethods:              type: array              items:                $ref: 'TS26512\_CommonData.yaml#/components/schemas/SdfMethod'              minItems: 0            externalReferences:              type: array              items:                type: string              minItems: 1        clientMetricsReportingConfiguration:          type: array          items:            type: object            required:            - serverAddresses            - scheme            - samplePercentage            - urlFilters            - metrics            properties:              serverAddresses:                $ref: '#/components/schemas/ServerAddresses'              scheme:                $ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'              dataNetworkName:                $ref: 'TS29571\_CommonData.yaml#/components/schemas/Dnn'              reportingInterval:                $ref: 'TS29571\_CommonData.yaml#/components/schemas/DurationSec'              samplePercentage:                              $ref: 'TS26512\_CommonData.yaml#/components/schemas/Percentage'              urlFilters:                type: array                items:                  type: string                minItems: 0              metrics:                type: array                items:                  type: string        networkAssistanceConfiguration:          type: object          required:             - serverAddresses          properties:            serverAddresses:              $ref: '#/components/schemas/ServerAddresses' clientEdgeResourcesConfiguration:          type: object          required:            - easDiscoveryTemplate          properties:            eligibilityCriteria:              $ref: 'TS26512\_CommonData.yaml#/components/schemas/EdgeProcessingEligibilityCriteria'            easDiscoveryTemplate:              $ref: '#/components/schemas/EASDiscoveryTemplate'            easRelocationRequirements:              $ref: '#/components/schemas/M5EASRelocationRequirements'    M5EASRelocationRequirements:      description: 'Relocation requirements of an EAS.'      type: object      required:        - tolerance      properties:        tolerance:          $ref: 'TS26512\_CommonData.yaml#/components/schemas/EASRelocationTolerance'        maxInterruptionDuration:          $ref: 'TS29571\_CommonData.yaml#/components/schemas/UintegerRm'    EASDiscoveryTemplate:      description: 'A template for discovering an EAS instance .'      type: object      properties:        easId:          type: string        easType:          type: string        easProviderIds:          type: array          items:            type: string          minItems: 1        serviceFeatures:          type: array          items:            type: string          minItems: 1 |

\*\*\*\* Next Change \*\*\*\*

Annex X (Informative): 5GMS AS discovery

# X.1 General

This annex describes 5GMS AS discovery, including aspects of the discovery system provisioning. Annex X.2 describes the discovery procedure, leveraging the Domain Name System (DNS). Annex X.3 describes the discovery procedure, leveraging the EDGEAPP EAS registration and discovery procedure.

# X.2 5GMS AS discovery based on DNS

Figure X.2-1 illustrates the initial provisioning needed for discovering an 5GMS AS and the eventual 5GMS discovery sequence using the Domain Name System (DNS). Specific focus here is on the provisioning and usage of TLS Certificates. Intention is that the 5GMS aware client ensures, that it has connected a TLS connection to an authorized server.



Figure X.2-1: 5GMS AS discovery using DNS

Description of the sequence

At application service deployment time

1. The Application creates TLS server certificates for its application servers. The TLS server certificates may be obtained using M1 Server Certificates Provisioning procedure.

2. The Application provider provisions the application service. The FQDNs of the 5GMS AS are configured using the distributionConfigurations.canonicalDomainName or distributionConfigurations.domainNameAlias properties of the Content Hosting Configuration API.

3. The Application Provider configures the Server Certificate of the domain names using the distributionConfigurations.certificateId property o the Content Hosting Configuration API.

4. The Application Provider configures DNS with the a list of IP addresses for each FQDN. The Application provider may also configure redirections using DNS CNAME records.

At time of installing a 5GMS aware Application on a device

5. When the 5GMS aware Application is installed on a device, it contains an implementation specific bootstrapping sequence for retrieving the needed list of URLs for accessing associated services.

At time of 5GMS aware Application usage

6. When the 5GMS aware Application is implemented using M5 Service Access information retrieval, the 5GMS aware Application triggers the usage of the M5 Service Access Information API. The 5GMS Client retrieve a list of URLs, associated with different 5GMS services.

7. When the 5GMS aware Application desires to access a 5GMS service, it looks up the associated URL and extracts the FQDN.

8. The 5GMS aware application uses DNS for resolving the FQDN to an IP address.

9. The 5GMS aware application establishes a TLS connection to the target IP address. With the responses, the 5GMS aware application obtains the TLS server certificate from the server

10. The 5GMS aware application validates the server certificate. The server certificate validation contains many different steps. One of the steps is to check, whether the Domain Name of the input FQDN (Step 8) is listed within the server certificate, obtained in Step 9.

When all server certificate validation steps are successfully passed, then the following steps are executed

11. The 5GMS aware client continues requesting the resource, identified by the URL.

# X.3 5GMS AS discovery based on EDGEAPP procedures

Figure X.3-1 illustrates the initial provisioning needed for discovering an 5GMS AS and the eventual 5GMS discovery sequence using the EDGEAPP procedures as defined in TS 23.558 [X]. Specific focus here is on the provisioning and usage of TLS Certificates and its relation to the EDGEAPP registration and discovery sequence. Intention is that the 5GMS aware client ensures, that it has connected a TLS connection to an authorized server.

Figure X.3-1 shows the 5GMS AS discovery with EDGEAPP.



Figure X.3-1: 5GMS AS discovery with EDGEAPP

Description of the sequence

Pre-requisite:

- The EEC has authenticated itself with the EDGEAPP system and has obtained information about the EES.

At application service deployment time

1. The Application creates TLS server certificates for its application servers. The TLS server certificates may be obtained using M1 Server Certificates Provisioning procedure.

2. The Application provider provisions the application service. The FQDNs of the 5GMS AS are configured using the distributionConfigurations.canonicalDomainName or distributionConfigurations.domainNameAlias properties of the Content Hosting Configuration API.

2a. The Application provider provisions the Edge Resource Configuration. Profile information, describing the 5GMS AS (e.g. in form of EASID or EAS Type or EAS Provider, etc) are configured using the Edge Resopurce Configuration API.

3. The Application Provider configures the Server Certificate of the domain names using the distributionConfigurations.certificateId property o the Content Hosting Configuration API. The resource id of the associated Edge Resource Configuration is added to the Content Hosting Configuration.

4. The EAS instances registers itself (using EDG-3 procedures) with the EES, providing its configured EAS Profile and its IP addresse.

At time of installing a 5GMS aware Application on a device

5. When the 5GMS aware Application is installed on a device, it contains an implementation specific bootstrapping sequence for retrieving the needed list of URLs for accessing associated services.

At time of 5GMS aware Application usage

6. When the 5GMS aware Application is implemented using M5 Service Access information retrieval, the 5GMS aware Application triggers the usage of the M5 Service Access Information API. The 5GMS Client retrieve a list of URLs, associated with different 5GMS services. The M5 Service Access Information also contains for each 5GMS service an Discovery Template, containing the needed parameters to compile the EAS Discovery Filter when needed.

7. When the 5GMS aware Application desires to access a 5GMS service, it looks up the associated URL and extracts the FQDN. The 5GMS Client looks up the associated EAS Discovery Template.

8. The 5GMS aware application uses EDGE-4 for resolving the EAS Discovery Filter.

9. The 5GMS aware application establishes a TLS connection to the target IP address. With the responses, the 5GMS aware application obtains the TLS server certificate from the server

10. The 5GMS aware application validates the server certificate. The server certificate validation contains many different steps. One of the steps is to check, whether the Domain Name of the input FQDN (Step 8) is listed within the server certificate, obtained in Step 9.

When all server certificate validation steps are successfully passed, then the following steps are executed

11. The 5GMS aware client continues requesting the resource, identified by the URL.

\*\*\*\* Last Change \*\*\*\*